CLAIMS

1. A method for digestion of sludge in water purification, c h a r a c t e r i s e d by the steps:

a) providing at least one enzyme mixture(s) capable of digesting natural polymeric materials;

b) adding the at least one enzyme mixture(s) sequentially to an aqueous sludge suspension; and thereafter,

c) optionally adding at least one species of fermenting bacteria to the suspension, thereby fermenting the resulting suspension obtained in step b).

2. A method for digestion of sludge in water purification, c h a r a c t e r i s e d by the steps:

a) providing an enzyme mixture capable of digesting natural polymeric materials;

b) adding the enzyme mixture to an aqueous sludge suspension; and thereafter,

c) adding at least one species of fermenting bacteria to the suspension, thereby fermenting the resulting suspension obtained in step b).

3. A method according to claim 1 or 2, c h a r a c t e r i s e d by that the enzymes in the at least one enzyme mixture(s) are chosen from cellulases, cellobiases, amylases, lipases, pectinases, dextranses, oxidoreductases, proteases, pulpzymes and oxidases.

4. A method according to any one of claims 1-3, c h a r a c t e r i s e d by that the enzymes in a first enzyme mixture are chosen from cellulases, cellobiases, amylases, lipases, pectinases, dextranses, oxidoreductases, pulpzymes and oxidases, and the enzymes in a second enzyme mixture are chosen from cellulases, cellobiases, amylases, lipases, pectinases, dextranses, oxidoreductases, proteases, pulpzymes and oxidases.

5. A method according to any one of claims 1-4,

c h a r a c t e r i s e d by that the vitality of the existing organisms of the sludge suspension is eliminated significantly.

6. A method according to any one of claims 1-5, c h a r a c t e r i s e d by that the enzyme mixture(s) comprise(s) a surfactant.

7. A method according to claim 6, c h a r a c t e r i s e d by that the surfactant is non-ionic.

8. A method according to claim 7, c h a r a c t e r i s e d by that the surfactant is chosen from natural and synthetic alcohol ethoxylates, FAE (fatty alcohol ethoxylate), non-ionic surface active agents prepared by the addition of ethylene oxide to propylene glycols, polydimethylsiloxane co-polymers and polyoxyethylene derivatives of fatty acid partial esters of hexitol anhydrides.

9. A method according to claim 8, c h a r a c t e r i s e d by that the surfactant is present in the range of 0.0025-5 w/w % of the sludge suspension, in particularly in the range of 0.0025-2 w/w %.

10. A method according to any one of claims 1-9, c h a r a c t e r i s e d by that the dose of the enzyme mixture in relation to sludge suspension is 0.2-0.001% enzyme per 1% TS sludge.

11. A method according to 10, c h a r a c t e r i s e d by that the dose is 0.06-0.001% enzyme per 1% TS sludge.

12. A method according to any one of claims 1-11, c h a r a c t e r i s e d by that the fermenting bacteria are chosen from acidogenic bacteria, acetogenic bacteria, and methane producing bacteria.

13. A method according to claim 12, c h a r a c t e r i s e d by that the fermenting bacteria are chosen from Gluconobacter oxydans, Acetobacter species, Acetogenium kivui, Bacillus maderans, polymyxa, Bacillus coagulans, Lactobacillus buchneri, Clostridium thermoaceticus, Clostridium lentocellum, Clostridium

formicoaceticu, Clostridium thermocellum and Pseudomonas species.

14. A method according to claim 13, c h a r a c t e r i s e d by that at least one of the species of the fermenting bacteria is methane producing bacteria.

15. A method according to claim 14, c h a r a c t e r i s e d by that the methane producing bacteria are chosen from Methanosarcina barkeri, Methanosarcina mazeii, Methanosarcina soehngenii and Methanosarcina acetivorans, and Methanosaeta, and mixtures thereof.

16. A method according to claim 15, c h a r a c t e r i s e d by that the methane produced is separated from the sludge suspension.

17. A method according to any one of claims 1-16, c h a r a c t e r i s e d by that the natural polymeric materials are proteins, polysaccharides, polyphenols (lignins), fats, waxes, and mineral oils.

18. A method according to any one of claims 1-17, c h a r a c t e r i s e d by that the temperature of the sludge suspension is from 20°C to 90°C.

19. A method according to any one of claims 1-18, c h a r a c t e r i s e d by that the sludge suspension is subjected to agitation in the range from 0 to 180 rpm.

20. A method according to any one of claims 1-19, c h a r a c t e r i s e d by that the sludge is pre-concentrated, prior to the addition of enzymes and bacteria, by gravitation or enhanced sedimentation to the range 10-300 g sludge solids per 1 l sludge suspension.

21. A method according to any one of claims 1-20, c h a r a c t e r i s e d by that the sludge suspension is subjected to a pre-treatment chosen from the group comprising acid treatment, base treatment, sonication, grinding and heating.

22. Use of a method according to any one of claims 1-21, in addition to conventional digestion used in water purification.

23. Use of a method according to any one of claims 1-21, instead of conventional digestion used in water purification.